

Voith Paper Patent GmbH

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# **Method for Heating a Roller**

This invention relates to a method for heating a roller used in the  
 production and/or finishing of a web of material, particularly a paper web  
 10 or paperboard web.

The object of the present invention is to create an improved method of the  
 type initially referred to. In particular the use of renewable fuels should  
 also be possible.

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This object is accomplished in accordance with the invention in that the  
 roller is heated from the outside by a heated gas. In this case the heat gas  
 is generated preferably by means of at least one burner arranged near the  
 roller surface. The heat gas emerging from the burner can then act on the  
 20 surface of the rotating roller.

Hence the heat is generated where it is required. Furthermore, renewable  
 energies can now be used to generate the heat required.

25 According to a preferred practical embodiment of the method according to  
 the invention, the roller is heatable on a zone basis viewed in the direction  
 of the roller axis, with the various zones being heatable independently of  
 each other at least in part. As such, differentiation across the width of the  
 respective web is also possible if required.

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For example, provision can be made for several burners distributed over the length of the roller.

According to an advantageous practical embodiment of the method  
5 according to the invention, the burner used is a catalytic burner by means of which the heat gas is generated through combustion of a fuel with air or oxygen.

A burner can thus comprise, for example, a carrier with a catalytic  
10 coating.

The fuel used can be particularly a fuel gas. Hence the burner can be fed, for example, with an in particular adjustable fuel gas/air mixture. In this case preferably fuel and air are fed to a mixing element upstream from the  
15 respective burner.

Preferably, supplied air is distributed by an air distributor among several burners.

20 The reaction or roller temperature is set or controlled preferably by means of the fuel/air mass flow ratio.

For example, the fuel gas mass flow and/or the fuel gas concentration in the air can be controlled. The control in question is performed preferably  
25 on a zone basis.

The fuel used can be, for example, hydrogen, hydrogen-rich gas (reformat) or natural gas.

According to another advantageous embodiment of the method according to the invention, a respective burner is arranged in an air-moving chamber and the air flowing over the burner is mixed with the burner waste gas. In this case the air flowing over the burner can be expediently  
5 mixed with the waste gas from the burner by means of a mixing element in the region of the end of the air-moving chamber facing the roller.

In this case the air flowing over the burner can be heated by said burner. It is also conceivable, however, for the burner to work adiabatically,  
10 meaning that there is no transfer of heat to the "bypass flow". The cold bypass flow is then mixed with the hot burner waste gas, resulting downstream from the mixing element in a mixture with an adequate temperature.

15 Such an embodiment makes sense in particular when using a fuel that reacts with air only at high temperatures. Natural gas, for example, does not react fully with air until in a higher temperature range (600 – 800°C).

The hot gas temperatures would be too high for the roller surface.  
20 Therefore, the hot gas is mixed with the "cold" bypass flow.

According to another advantageous embodiment of the method according to the invention, gas generated by means of a burner is mixed with supplied cold air in at least one mixing element in order to generate the  
25 heat gas for acting on the roller. In this case it is advantageous for the mass flow of the cold air supplied to the mixing element to be adjustable or controllable. Again, the burner is preferably supplied with air and fuel, particularly fuel gas. The fuel gas used in this case can be natural gas for example.

The hot gas generated by means of the burner is preferably distributed by a gas distributor among several mixing elements that are distributed over the length of the roller. The mass flows of cold air supplied to the various mixing elements are preferably individually adjustable or controllable at least in part.

Again, differentiation across the web width is thus possible in the latter case too.

The invention will be described in more detail in the following text using exemplary embodiments and with reference to the drawing, in which:

figure 1 is a schematic representation of a device for heating a roller with several catalytic burners that are arranged in succession in the direction of the roller axis and enable differentiation,

figure 2 is a schematic representation of another embodiment of the heating device in which the catalytic burners are arranged in each case in an air-moving chamber and the air heated by a respective burner is used to generate the heat gas which acts on the roller, and

figure 3 is a schematic representation of another embodiment in which the hot gas generated by means of a gas burner is distributed by a gas distributor among several mixing elements that are distributed over the axial length of the roller and are fed in addition with cold air, whereby the mass flows of cold air supplied to the various mixing elements are separately adjustable or controllable.

Figure 1 shows in a schematic representation a device 10 for heating a roller 12 that is used in particular for producing and/or finishing a web of material, particularly a paper web or paperboard web.

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The roller 12 can be heated from the outside by means of the device 10 using a heated gas 14. For this purpose the device 10 comprises several burners 18 which are distributed over the length of the roller 12 and arranged near the roller surface 16.

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The heat gas 14 emerging from the burners 18 acts accordingly on the surface 16 of the rotating roller 12.

In this case the roller 12 is heatable on a zone basis in the direction of the roller axis, thus enabling differentiation in the transverse direction of the web, meaning transverse to the running direction of the web.

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In the case under consideration, the burners 18 are catalytic burners by means of which the heat gas 14 is generated through combustion of a fuel 20 with air 22 or oxygen.

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Hence the burners 18 can each comprise a carrier 24 with a catalytic coating.

The fuel 20 provided can be in particular a fuel gas such as, for example, hydrogen ( $H_2$ ) or hydrogen-rich gas (reformat). In principle, fuels other than hydrogen are also conceivable however.

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An adjustable fuel gas/air mixture is fed in each case to the various catalytic burners 18. In this case a mixing element 26, to which fuel 20 and air 22 are fed, is installed respectively upstream from the burners 18.

- 5 Also, provision is made for an air distributor 28 by means of which supplied air 22 is distributed among the various catalytic burners 18.

In the case under consideration the reaction or roller temperature is adjustable or controllable on a zone basis by means of the respective  
 10 fuel/air mass flow ratio. For this purpose provision can be made, for example, for controlling the respective fuel gas mass flow and/or the respective fuel gas concentration in the air.

The control or adjustment in question can be performed on a zone basis.  
 15 In the case under consideration, control valves 32 are provided for this purpose in the various fuel supply lines 30 to the various mixing elements 26.

The various catalytic burners 18 are arranged respectively in a chamber  
 20 32 in which provision is also made respectively for the mixing element 26 that is installed upstream from the burner 18 in question. Using these chambers 32, heating gas 14 can be made to act on the roller 12 on a zone basis.

25 The embodiment of the heating device 10 presented in figure 2 differs from the one in figure 1 firstly in that the various catalytic burners 18 are arranged respectively in an air-moving chamber 34 and the air flowing over the burners 18 for generating the heat gas 14 for acting on the roller 12 is mixed with the burner waste gas.

In this case the air flowing over the burner can be heated by said burner. It is also conceivable, however, for the burner to work adiabatically, meaning that there is no transfer of heat to the "bypass flow". The cold bypass flow is then mixed with the hot burner waste gas, resulting  
5 downstream from the mixing element in a mixture with an adequate temperature. Such an embodiment makes sense in particular when using a fuel that reacts with air only at high temperatures. Natural gas, for example, does not react fully with air until in a high temperature range (600 – 800°C). The hot gas temperatures would be too high for the roller  
10 surface. Therefore, the hot gas is mixed with the "cold" bypass flow.

In this case provision is made in a respective air-moving chamber 34 in the region of its end facing the roller 12 for a mixing element 36 by means of which the air flowing over and heated by the catalytic burner 18 is  
15 mixed with the waste gas from the burner 18. The hot air emerging from the mixing elements 36 then acts accordingly on the roller 12.

Again, a mixing element 26 is installed respectively upstream from the catalytic burners 18 in order to generate the mixture of fuel and air  
20 supplied to the respective burner 18.

Natural gas, for example, is provided as fuel 20 in the case under consideration.

25 Otherwise, this embodiment again has at least substantially the same construction as the one in figure 1, mutually corresponding parts being assigned the same reference symbols. Again, differentiation across the web width is possible accordingly in the present case too.

Figure 3 shows a schematic representation of a further embodiment of the device 10.

In the case under consideration, the hot gas 40 generated by means of a  
5 gas burner 38 is distributed by a gas distributor 42 among several mixing  
elements 44 that are distributed over the length of the roller 12 and each  
supplied separately with cold air 46. The mass flows of cold air 46  
supplied to the various mixing elements 44 are therefore adjustable or  
controllable on a zone basis. In the case under consideration, throttle  
10 valves 50 are provided for this purpose in the various fuel supply lines 48  
to the various mixing elements 44.

The hot gas 40 supplied by the gas burner 38 is mixed with the cold air  
supplied through the cold air supply line 48 in question by means of the  
15 mixing elements 44, which again are arranged in a chamber 52, in order  
to generate the hot air 14 in question for acting on the roller 12.

As is evident in figure 2, a fuel gas 54, in this case natural gas for  
example, and air 56 are fed to the burner 38.  
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Again, the mass flows of cold air supplied to the various mixing elements  
44 are adjustable or controllable on a zone basis by means of the throttle  
valves 50. Differentiation in the transverse direction of the web is thus  
possible in this case too.



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**List of reference numerals**

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	10	Heating device
	12	Roller
	14	Heated gas, heat gas
	16	Roller surface
10	18	Catalytic burner
	20	Fuel
	22	Air
	24	Catalytic carrier with catalytic coating
	26	Mixing element
15	28	Air distributor
	30	Fuel supply line
	32	Chamber
	34	Air-moving chamber
	36	Mixing element
20	38	Gas burner
	40	Hot gas
	42	Gas distributor
	44	Mixing element
	46	Cold air
25	48	Cold air supply line
	50	Throttle valve
	52	Chamber
	54	Fuel gas
	56	Air
30	X	Roller axis